COMMONWEALTH OF VIRGINIA

GUIDANCE FOR CONDUCTING A COMPREHENSIVE PUBLIC DRINKING WATER SUPPLY NEEDS ASSESSMENT

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Virginia Department of Health, Department of Environmental Quality, Virginia Department of Housing and Community Development, Virginia Economic Development Partnership, Virginia Department of Agriculture and Consumer Services, and Ray Jackson, Chair, Drinking Water Advisory Committee (Citizen Committee Established by the *Waterworks Regulations*)

PREAMBLE

This Guidance is based on the State Constitution, the Code of Virginia, the Virginia Administrative Code and current agency policies, procedures, guidance and missions. The purpose of this Guidance is to provide assistance to public drinking water system (waterworks) owners in developing comprehensive public drinking water needs assessments. One underlying principle of the Guidance is that it primarily addresses the need for water to support the protection of public health, safety and welfare rather than the impacts of those needs on water resources. This document is the result of collaborative efforts on the parts of those agencies and persons listed above. This Guidance is simply a compendium of existing laws, regulations, policies and procedures and is not intended to establish new law or policy. No alternative assessment impact analyses are addressed by this Guidance.

The **State Constitution** is the organic and fundamental law of the Commonwealth and establishes the basic principles that control the action and decisions of all branches of government.

> Section 1 of Article XI of the State Constitution states "To the end that people have clean air, pure water, and the use and enjoyment for recreation of adequate public lands, water and other natural resources, it shall be the policy of the Commonwealth to conserve, develop, and utilize its natural resources, its public lands, and its historical sites and buildings. Further, it shall be the Commonwealth's policy to protect the atmosphere, lands, and waters from pollution, impairment or destruction, for the benefit, enjoyment, and general welfare of the people of the Commonwealth."

The **Code of Virginia** is a compilation of all the statutory laws of the Commonwealth of Virginia that are of a general and permanent nature.

The **Virginia Administrative Code** (VAC) comprises all regulations promulgated by state agencies and authorities to implement the Code of Virginia. The regulations contained in the VAC have the full force of law.

Policies, Procedures, Guidance comprises written or unwritten statements that an agency uses to operate on a day-to-day basis. They are considered guidance and are published annually in the *Virginia Register* in accordance with § 9-6.14:7.2 of the Code of Virginia. The latest publication date was February 14, 2000.

I. GENERAL

The Commonwealth of Virginia recognizes no single method for the projection of water demands. The appropriate methodology for the projection of water demands depends on the unique characteristics of the locality and the availability of information that will allow a locality to disaggregate water use by category and project and reaggregate the various different categories of use. Since 1982, the Commonwealth of Virginia has required water use to be reported. This information is critical to determining baseline conditions and should be used. This information is not disaggregated by category of use.

Categories of use typically used to disaggregate water demands include, but are not limited to, domestic use, commercial/institutional use, manufacturing/industrial use and public/unaccounted for water. There may be other categories of use that lend themselves to disaggregation. Examples are large discrete users or uses such as a hospital, factory, university, prison or military base. Care should be taken whenever using non-standard categories of water use, that water use is not double counted. For example, inmates should not be counted as residents in a computation of domestic use if the prisons water use is disaggregated and projected separately.

Each category of water use typically will have a water use coefficient and demand driver. For example, domestic water use is typically calculated by multiplying the number of persons served by the water supply system by a water demand coefficient of "*X*" gallons per capita per day. Commercial/institutional water use can be either calculated as function of population and driven by per capita water use or can be calculated as a function of employment and driven by per employee water use. Public and unaccounted for water is typically computed as a percentage of gross water use.

In general, larger localities are expected to have the data sources and wherewithal to disaggregate demands by category and after making appropriate assumptions for each category of use, reaggregate the demands for the purpose of making the total projection. Smaller and more rural localities may only be able to make a simple projection based upon population served and per capita water use combined for all categories of water use.

Regardless of the size of the locality, or the rigors of the disaggregation analysis, the quality of the projection is only as good as the respective assumptions. In all cases assumptions should be documented. Double counting, undocumented categories of water use, population projections deviating significantly from Virginia Employment Commission projections and undocumented and historically unprecedented job growth or water use coefficients are some of the pitfalls that will cause planners and regulators to question the projections.

Regardless of the methodology selected, the following formula is utilized in projecting future water demand:

Future Need = Projected Future Water Demand – Current Water Capacity

Where:

Current Water Capacity = Safe Yield of All Existing Approved Sources.

II. PROJECTION OF FUTURE WATER NEEDS

A. Planning for Waterworks Expansion

12 VAC 5-590-520A - "At such time as the water production of a community waterworks reaches 80% of the rated capacity of the waterworks for any consecutive three-month period, the owner shall cause plans and specifications to be developed for expansion of the waterworks to include a schedule for construction…"

Commentary - The *Waterworks Regulations* (12 VAC 5-590) require the owner of an existing waterworks to begin planning for the expansion of that waterworks. Specific criteria establish the point at which such planning must begin.

B. Planning Horizon

12 VAC 5-590-640 – "…Ordinarily, waterworks shall be designed to provide for the estimated population 10 to 30 years hence under predicted growth conditions…"

Commentary - Although the *Waterworks Regulations* provide a planning horizon of 10 to 30 years, the Department of Environmental Quality (DEQ) utilizes a 50 year water supply planning horizon policy. The third edition of the American Water Works Association and the American Society of Civil Engineers book entitled Water Treatment Plant Design, the standard treatise on this topic, states that "Master planning studies often develop the water supply and treatment needs for 30 to 50 years into the future."

C. Population Projections

Code of Virginia, § 60.2-113 - "The [Virginia Employment] Commission shall take all necessary steps through its appropriate divisions and with advice of such advisory boards and committees as it may have to… 5. Prepare official short and long range population projections for the Commonwealth for use by the General Assembly and state agencies with programs which involve or necessitate population projections…"

Commentary - In order to ensure that population projections are based upon uniform, broadly accepted, and sound principles, the Virginia Employment Commission is responsible for providing assistance to local governments. Projections for periods lying beyond the currently available Virginia Employment Commission projections must be developed using the best available professional judgement as to the rate of growth.

D. Economic Development

Commentary - It is the policy of the Virginia Economic Development Partnership to encourage economic development in all localities requesting same. The mission statement of the Partnership is "to enhance the quality of life and raise the standard of living for all Virginians, in collaboration with Virginia communities, through aggressive business recruitment, expansion assistance, and trade development, thereby building the tax base and creating higher income employment opportunities." It is clearly the Commonwealth's intent to encourage economic development and to "raise the standard of living for all Virginians". Development of the most reliable source of unrestricted water supply leads to an increased ability to market the area to businesses or industries that are looking to expand or relocate, as they are assured of a constant supply of water. The economic growth resulting from those firms generally results in an increased standard of living for those in the communities with increased commercial and industrial activity. Targeted industries, i.e. those that Virginia is specifically trying to recruit, are shown in Appendix A.

E. Domestic Consumptive Use

12 VAC 5-590-690 - "The design capacity of the waterworks shall exceed the maximum daily water demand of the system. Waterworks shall normally be designed on the following basis of water consumption. If deviations are made, they shall be based on sound engineering knowledge substantiated in the designer's report and approved by the [D]ivision [of Water Supply Engineering].

A. Daily water consumption rates (annual daily demand): [See Appendix B]."

Commentary - The best source of information for domestic consumptive use comes from the local waterworks records. A 1995 U.S. Geological Survey (USGS) study estimates that domestic consumptive use averages 86 gallons per capita per day in Virginia.

To some degree, the current level of consumptive water use reflects or subsumes such factors as the impact of regulations (e.g., Uniform Statewide Building Code requirements for plumbing fixture performance) and pricing policies for treated

water. If changes in these factors are anticipated within the planning horizon, they should be explicitly considered in the development of future demand levels.

In computing domestic use, localities may either disaggregate domestic use from other types of use based on their billing records, or they must make assumptions on what percentage of their total use is domestic use based on the particular characteristics of their local system and its socioeconomic situation.

In projecting domestic use, localities must either make general assumptions projecting marginal decreases in per capita use due to household water saving devices or conduct detailed studies, which analyze the age of housing stock and the degree to which water saving devices are already present and the degree to which they will result in future savings.

F. Definition of Pure Water

Code of Virginia, § 32.1-176. 5 - "'Pure water' means water fit for human consumption and domestic use…and (ii) which is adequate in quantity and quality for the minimum health requirements of the persons served."

12 VAC 5-590-510E- "All waterworks shall provide a minimum working pressure of 20 psi at all service connections."

12 VAC 5-590-690C- " All waterworks shall provide at least a minimum working (under flow) pressure of 20 psi at the service connection based on the greater of the maximum hour or maximum day plus applicable fire flows. Applicable fire flows shall be selected by coordination between the water supply owner, design consultant, local officials and the local fire [marshal]. When the number of residential units is less than 1000, the formula $Q = 11.4 \cdot N^{0.544}$; is acceptable for estimating maximum hour domestic demand flow, where Q = total gallons per minute and N = number of residential units. The [State Health] commissioner can require a higher design pressure if indicated by site conditions."

Commentary - One of the most important definitions in the *Waterworks Regulations* is that of pure water. The definition incorporates not only the concept of providing healthy water but it also includes the requirement that a sufficient quantity of water be available. Domestic demand and fire flows must be used in design calculations when fire flow is provided. The waterworks must be designed to maintain a minimum pressure of 20 psi.

III. DETERMINATION OF CURRENT WATER CAPACITIES

A. Permit to Construct and Operate a Waterworks

Code of Virginia, § 32.1-172A. - "No owner shall establish, construct or operate any waterworks or water supply in the Commonwealth without a written permit from the [State Health] Commissioner…"

Commentary - In order for the establishment or expansion of a waterworks to occur in a manner that is technically correct and that protects the public health, the Commissioner must issue a permit for the construction (expansion) of that waterworks. The construction permit is issued only after the applicant meets all of the requirements of the *Waterworks Regulations.* This is accomplished through an engineering evaluation by the Division of Water Supply Engineering of the application, plans, specifications, and engineering documents associated with the project. Construction cannot begin until the construction permit is issued. The details of the engineering evaluation are discussed later in this document and are clearly stated in the *Waterworks Regulations.*

B. Virginia Water Protection Permit

Code of Virginia, § 62.1-44.15:5B- "The [State Water Control] Board shall issue a Virginia Water Protection Permit for an activity requiring a § 401 certification if it has determined that the proposed activity is consistent with the provisions of the Clean Water Act…Conditions contained in a Virginia Water Protection Permit may include, but are not limited to, the volume of water which may be withdrawn…Domestic and other existing uses shall be considered the highest priority uses…"

Code of Virginia § 62.1-11 –"**Waters declared natural resource; state regulation and conservation; limitations upon right to use.** – A. Such waters are a natural resource which should be regulated by the Commonwealth.
B. The regulation, control, development and use of waters for all purposes beneficial to the public are within the jurisdiction of the Commonwealth…
E. The right to the use of water or the flow of water…for beneficial use of the public served…"

Commentary - Note that the Code of Virginia assigns the highest priority to domestic and other existing uses in the determination by the State Water Control Board to issue or deny a Virginia Water Protection Permit.

A Virginia Water Protection Permit is needed for any project that requires federal permits for discharge of dredged material, filling in a waterway or wetland, work or construction in a navigable waterway, or a water withdrawal. Without the

Virginia Water Protection Permit, the federal permits will not be issued. The regulation is largely procedural. The regulation does require "sequencing"; that is, adverse environmental impacts are to be avoided or minimized and unavoidable impacts mitigated.

The State Water Control Board issues the Virginia Water Protection Permit. The Board takes into account the State Policy as to Waters as well as the Board's own Water Resources Policy in issuing permits involving water resource allocation issues. The Virginia Water Protection Permit statute specifically mentions volumes of water to be withdrawn as appropriate conditions.

State policy requires the proper development, wise use, conservation and protection of water resources, for all purposes beneficial to the public, including the right to the use or flow of water from any natural watercourse as can reasonably be required by the public to be served.

Virginia Water Protection Permits are required to protect in-stream beneficial uses. This is done in two ways; by setting certain low flows off limits to withdrawals and by setting limits on the amount of water that can be pumped. Both types of conditions limit water availability from any project and must be considered in computing the safe yield.

C. Ground Water Withdrawal Permit

Code of Virginia, § 62.1-256 - "The [State Water Control] Board shall have the following duties and powers: (1) To issue ground water withdrawal permits in accordance with regulations adopted by the [State Water Control] Board…"

Commentary - Virginia manages ground water through a program regulating the withdrawals in certain areas called Ground Water Management Areas (GWMA). Persons or entities wishing to withdraw 300,000 gallons per month or more must apply for and receive a permit before withdrawal can start. At present, two GWMA have been declared: the Eastern Shore GWMA (includes Accomack and Northampton Counties) and the Eastern Virginia GWMA (includes areas east of I-95 and south of the Mattaponi and York Rivers). For additional information on GWMA see IVC2 below.

D. Water Withdrawal Reporting

Code of Virginia, §62.1-38C – " The [State Water Control] Board may, by regulation, require each water user withdrawing surface or subsurface water or both during each year to register, by a date to be established by the Board, water withdrawal and use data for the previous year including the estimated average daily withdrawal, maximum daily withdrawal, sources of water withdrawn, and volume of wastewater discharge…"

9 VAC 25-200-20 - "This chapter requires the reporting of water withdrawal information to the [State Water Control] [B]oard for its use in preparing plans and programs for the management of water resources of the Commonwealth pursuant to § 62.1-44.38 of the Code of Virginia…"

Commentary - The data collected under this regulation are used by the State Water Control Board in formulating water supply plans, for consideration by the General Assembly and in delineating surface water management areas, and are available to local governments and private interests to assist them in their own water supply planning efforts.

IV. SECURING AN ADEQUATE SOURCE

A. General

Code of Virginia, § 32.1-169 - "The Board [of Health] shall have general supervision and control over all water supplies and waterworks in the Commonwealth…and may require that all water supplies be pure water…"

Code of Virginia, § 32.1-171 - "The [State Health] Commissioner shall, upon request and without charge, provide technical assistance to owners regarding the most appropriate source of water supply and the best method of assuring pure water…"

12 VAC 5-590-690 - "The design capacity of the waterworks shall exceed the maximum daily water demand of the system…"

12 VAC 5-590-10 - "The maximum daily water demand' means the rate of water usage during the day of maximum water use."

Commentary - The philosophy of the *Waterworks Regulations* is abundantly clear. All waterworks are to be designed, whether new or expanded, to provide an adequate source of drinking water at all times. The only exception to this is when a drought of record dating from 1930 to the present is encountered.

When such a drought occurs, the waterworks institutes progressively more stringent water conservation methods. Because a waterworks never knows at the onset if a drought will be a record, the waterworks will typically "hedge it's bets" by implementing its own pre-determined set of conservation methods.

B. Water, Sources and Use Defined

Code of Virginia § 62.1-10(a) - "Water" includes all waters, on the surface and under the ground, wholly or partially within or bordering the Commonwealth or within its jurisdiction and which affect the public welfare."

Code of Virginia § 61.1-10(b) - "'Beneficial use' means both instream and offstream uses. Instream beneficial uses include, but are not limited to, the protection of fish and wildlife habitat, maintenance of waste assimilation, recreation, navigation, and cultural and aesthetic values. Offstream beneficial uses include, but are not limited to, domestic (including public water supply), agricultural, electric power generation, commercial and industrial uses. Public water supply uses for human consumption shall be considered the highest priority."

Code of Virginia § 62.1-242 – "'Surface water' means any water in the Commonwealth, except ground water, as defined in § 62.1-255."

Code of Virginia § 62.1-255 – "'Ground water' means any water, except capillary moisture, beneath the land surface in the zone of saturation or beneath the bed of any stream, lake, reservoir or other body of surface water wholly or partially within the boundaries of this Commonwealth, whatever the subsurface geologic structure in which such water stands, flows, percolates or otherwise occurs."

12 VAC 5-590-830A - "A surface water supply source includes all tributary streams and drainage basins, natural lakes, and artificial reservoirs or impoundments above the point of water supply intake."

C. Water Management Areas

1. Surface Water Management Areas

Code of Virginia, § 62.1-246 - "The [State Water Control] Board upon its own motion or, in its discretion, upon receipt of a petition therefor by any county, city or town within the surface management area in question…may initiate a surface water management area proceeding…If, after a public hearing [is] held...the Board finds that the conditions required above exist and further finds that the public welfare, health and safety require that regulatory efforts be initiated, the [State Water Control] Board shall declare the area in question to be a surface water management area…"

Code of Virginia, § 62.1-247- "After an area has been declared a surface water management area by an order of the [State Water Control] Board, no person shall withdraw any surface water, except for withdrawals exempted

under § 62.1–243…without a surface water withdrawal permit issued by the [State Water Control] Board."

Commentary - This Act authorizes the State Water Control Board to establish surface water management areas and to issue water withdrawal permits and certificates to persons withdrawing from those surface water management areas.

Surface Water Management Areas are geographically defined areas where surface water resources have a history of low flow conditions that threaten important in-stream and off-stream uses. Water withdrawals of 300,000 gallons per month or more are required to have a surface water withdrawal permit or certificate.

Currently there are no surface water management areas in the State.

2. Ground Water Management Areas (See IIIC.)

Code of Virginia, § 62.1-257 - "The [State Water Control] Board upon its own motion or, in its discretion, upon receipt of a petition by any county, city or town within the area of question, may initiate a ground water management area proceeding, whenever in its judgment, there may be reasons to believe that…If the [State Water Control] Board finds any one of the conditions required above exists, and further finds that the public welfare, safety and health require that regulatory efforts be initiated, the [State Water Control]Board shall by regulation declare the area in question to be a ground water management area…"

Code of Virginia, § 62.1-258 - "It shall be unlawful in a ground water management area for any person to withdraw, attempt to withdraw, or allow the withdrawal of any ground water, other than in accordance with a ground water withdrawal permit…"

9 VAC 25-610-110D3a -"The applicant demonstrates that no other sources of water supply, including reclaimed water, are viable."

Commentary - This Act recognizes and declares that the right to reasonable control of all ground water resources within the Commonwealth belongs to the public and that in order to conserve, protect and beneficially utilize the ground water of Virginia, and to ensure the public welfare, safety and health, provision for management of ground water resources is essential.

The VAC establishes ground water as the source of last resort within a ground water management area and requires that the State Water Control Board issue

ground water permits only in instances where no other sources of water supply are available.

D. Utilizing Best Raw Water Source

12 VAC 5-590-820 - "Preference shall be given to the best available sources of supply which present minimal risks of contamination from wastewater and which contain a minimum of impurities that may be hazardous to health…"

Commentary - It is the policy of the Commonwealth to utilize the best (cleanest) source of raw water available. This presents a two-fold benefit to the consumers. First, it minimizes the amount or numbers of contaminants in the raw water, thereby, reducing inherent risk. Second, the use of the best source of water reduces the cost of treatment that is ultimately borne by all customers. By keeping production costs as low as possible, water service can be provided to additional, low-income, underserved areas (areas that currently do not have access to adequate supplies of drinking water, especially those where a significant number of homes lack indoor plumbing).

E. Natural Water Sources (Ground Water and Surface Water)

9 VAC 25-390-30 - "…1b Total withdrawal from coastal zone aquifers should be limited to such quantity as to prevent the intrusion of salinity beyond the limit determined acceptable for the beneficial use of the aquifer. 1c Total withdrawal from a specific aquifer shall not exceed estimated recharge except for short (one to two year) periods of time: the divergence should not be great so as to affect unreasonably legal rights to withdrawal or to affect the capability of the aquifer to be recharged fully in the future. 1d Conjunctive use of groundwater and surface water is encouraged…"

Commentary - The preceding two paragraphs are included in the State Water Control Board's Water Resources Policies. In order to fulfill its statutory responsibilities the Board adheres to the Water Resources Policies in preparing Water Resources management Plans, advising on the adequacy and desirability of water resource projects, and authorizing specific water resource projects or commenting on projects which affect water resources.

F. Safe Yield

12 VAC 5-590-830A2 - "The safe yield of the source shall be determined as follows:

a. Simple intake (free-flowing stream). The safe yield is defined as the minimum withdrawal rate available during a day and recurring every 30 years (30 year-one day low flow). To generate the report for this, data is to be used to illustrate the worst drought of record in Virginia since 1930. If actual gauge records are not available for this, gauges are to be correlated from similar watersheds and numbers are to be synthesized; and
b. Complex intake (impoundments in conjunction with streams). The safe yield is defined as the minimum withdrawal rate available to withstand the worst drought of record in Virginia since 1930. If actual gauge records are not available, correlation is to be made with a similar watershed and numbers synthesized in order to develop the report.

Note: Local governments may request this aid from the Department of Environmental Quality (DEQ) by contacting either the Health Department's Office of Water Programs or the DEQ's headquarters in Richmond."

Commentary - Historically, the Virginia Department of Health has relied upon the Department of Environmental Quality to make safe yield evaluations.

G. Risks

12 VAC 5-590-830A- "The quantity of water at the source shall:

a. Be adequate to supply the water demand of the service area;
b. Provide a reasonable surplus for anticipated growth; and
c. Be adequate to compensate for all losses, including evaporation, seepage, flow-by requirements, etc…"

Commentary - Water supply sources with permitted flow-by requirements or permitted limits on withdrawals should be used in the determination of safe yield. Proposed flow-by requirements should not be used if they differ from actual permitted requirements. An important tenet of the *Waterworks Regulations* is that a waterworks has the responsibility to meet the definition of pure water (quality and quantity) at all times. If a drought were to occur, the waterworks should begin its conservation methods (quantity); however, the quality aspects must be maintained.

H. Water Resources Policies on Water Supply and Storage

9 VAC 25-390-30(5a) - "Municipal areas should have adequate off-stream raw water storage. The amount of storage should be governed by such factors as

community size and demand, hydrographic characteristics of the supply area (including well fields) and susceptibility to accidental contamination."

9 VAC 25-390-30(5b) - "Water systems should be interconnected whenever practicable in order that they may mutually support or aid each other in emergency situations, and assure the best possible uses of available surface and ground water resources…"

Commentary - The preceding two paragraphs are included in the State Water Control Board's Water Resources Policies. Adherence to these policies reduces the water systems' vulnerability to drought.

I. Powers of Local Governments/Planning Districts

Code of Virginia, § 15.2-4207A - "It is the purpose of the planning district commission to encourage and facilitate local government cooperation and state-local cooperation in addressing on a regional basis problems of greater than local significance. The cooperation resulting from this chapter is intended to facilitate the recognition and analysis of regional opportunities and take account of regional influences in planning and implementing public policies and services. Functional areas warranting regional cooperation may include, but not be limited to…(ii) solid waste, water supply and other environmental management…"

Code of Virginia, § 15.2-4208 - "Planning district commissions shall have the following duties and authority:

1. To conduct studies on issues and problems of regional significance…
12. To collect and maintain demographic, economic and other data concerning the region and member localities, and acts as a state data center affiliate in cooperation with the Virginia Employment Commission."

Commentary - In developing sources of water supply for new or expanding waterworks, the Commonwealth relies upon all areas of expertise to assist the waterworks owner in securing and utilizing the most reliable information available. One of the functions of the planning district commission is to assist local governments gathering and assessing this information. Water supply development is a joint local-regional-state process in Virginia.

J. Technical Planning Assistance

Code of Virginia, § 62.1-44.38F - "The [State Water Control] Board, upon written request of a political subdivision of the Commonwealth, shall provide water supply planning assistance to such political subdivision, to include assistance in preparing drought management strategies, water conservation programs, evaluation of alternative water, sources state enabling legislation to facilitate a

specific situation, applications for federal grants or permits, or other such planning activities to facilitate intergovernmental cooperation and coordination."

Commentary - Provision of technical assistance to local governments will help promote and secure the maximum beneficial use of the water resources of the Commonwealth.

K. Engineering Reports and Studies

12 VAC 5-590-200 - "Construction permits are issued by the [State Health] commissioner, but all requests for a construction permit are directed initially to the Field Office. The procedure for obtaining the permit includes the following steps: (i) the submission of an application, (ii) a preliminary engineering conference, (iii) the submission of an engineer's report (optional at the discretion of the Field Director), and (iv) the submission of plans, specifications, design criteria and other data in the number requested by the [State Health] commissioner."

12 VAC 5-590-200C -"The engineer's report and preliminary plans for waterworks shall present the following information where applicable:…

2c. An appraisal of the future requirements for service, including existing and potential industrial commercial, institutional and other water supply needs…

3. Where two or more solutions exist for providing public water supply facilities, each of which is feasible and practicable, the report shall discuss alternate plans and give reasons for selecting the one recommended, including financial considerations….

5. Water Consumption-The report shall include:
   a. A description of the population trends as indicated by available records, and the estimated population which will be served by the proposed water system or expanded system.
   b. Present and future water consumption values used as the basis of design.
   c. Present and future yield of the sources of supply…

8. Source of water supply-Describe the proposed source or sources of water to be developed and the reasons for their selection by supplying the following data:
   a. Surface water sources
      (1) Hydrological data, stream flow, and weather records;
      (2) Safe yield, including all factors that might affect it;
      (3) Maximum flood flow, together with approval for safety features of spillway and dam from appropriate reviewing authority;
      (4) Summarized quality of raw water with special references to fluctuations in quality, changing meteorological conditions, sources of contamination, measures to protect the watershed, etc.

b. Groundwater sources
   (1) Sites considered,
   (2) Advantages of site selected,
   (3) Elevation with respect to surroundings and 100-year flood,
   (4) Probable character of geological formations through which source is to be developed,
   (5) Unusual geological conditions affecting site,
   (6) Summary of source exploration , test well depth and method of construction, placement of liners or screens; pumping test, hours, capacity; water level and specified yield, water quality,
   (7) Possible sources of contamination."

12 VAC 5-590-200F - "A summary of complete design criteria shall be submitted for the proposed project, including, but not limited to, the following where applicable:

1. Yield of sources of supply.
2. Reservoir surface area.
3. Area of watershed.
4. Estimated water consumption.
5. Number of proposed services.
6. Fire-fighting requirements..."

Commentary - The *Waterworks Regulations* are very definitive in specifying what actions and decisions a waterworks owner must make when developing a water supply. The excerpts shown above are only some of the information the Virginia Department of Health requires the owner to provide. Furthermore, the Virginia Department of Health requires a preliminary engineering report before the waterworks owner begins final design of the waterworks. When all the information has been provided and final plans and specifications have been developed, the Virginia Department of Health undertakes an extensive engineering evaluation to ensure that the consumers on the waterworks will be provided pure water.

APPENDIX A

FY 2000 Initiatives – Targeted Industries

- Semiconductors/Electronics
- Automotive
- Office-Service/Back Office
- Information Technology/Telecommunications
- Warehouse/Distribution
- Food Processing
- Pharmaceuticals/Biotechnology
- Plastics
- Printing and Publishing
- Aerospace
- Machinery/Metalworking
- Woodworking/Furniture
- Existing Virginia Industries

APPENDIX B

Consumptive Uses

12 VAC 5 – 590 – 690. "Capacity of Waterworks.

The design capacity of the waterworks shall exceed the maximum daily water demand of the system. Waterworks shall normally be designed on the following basis of water consumption. If deviations are made, they shall be based on sound engineering knowledge substantiated in the designer's report and approved by the [D]ivision [of Water Supply Engineering].

A. Daily water consumption rates (annual daily water demand):

Dwellings, per person	100 gpd
High schools with showers, per person	16 gpd
Elementary schools without showers, per person	10 gpd
Boarding Schools, per person	75 gpd
Motels at 65 gallons per person, minimum per room	130 gpd
Trailer courts at three persons per trailer, per trailer	300 gpd
Restaurants, per seat	50 gpd
Interstate or through highway restaurants, per seat	180 gpd
Interstate rest areas, per person	5 gpd
Service Stations, per vehicle serviced	10 gpd
Factories, per person, per eight-hour shift	15-35 gpd
Shopping Centers, per 1,000 sq. ft. of ultimate floor space	200-300 gpd
Hospitals, per bed	300 gpd
Nursing homes, per bed	200 gpd

Home for the aged, per bed	100 gpd
Doctor's office in medical center	500 gpd
Laundromats, 9 to 12 # machines, per machine	500 gpd
Swimming Pools, per swimmer	10 gpd
Theaters, drive-in type, per car	5 gpd
Theaters, auditorium type, per seat	5 gpd
Picnic Areas, per person	5 gpd
Camps, resort, day and night with limited plumbing per camp site	50 gpd
Luxury camps with flush toilets, per camp site	100 gpd